TELECOMMUNICATIONS AND NETWORKS

Telecommunication

Call center

Support center

Hotline

Phone receiver

Digital phone

Cordless phone

Landline phone

Walkie Talkie

Police radio

Aviation

Base station

Communication tower

Dish antenna

Satellite

Global communication

Broadcasting

Active PC

Antenna TV

Transportation

Rocket

Telecommunication is the transmission of information by various types of technologies over wire, radio, optical or other electromagnetic systems.

Role of telecommunication in a firm

Transmit Data

Perhaps the most important role of telecommunications is fulfilling its most basic purpose of transmitting data.

Improve Efficiency & Productivity

It essentially reduces the costs of all transactions.

Reach More Customers

telecommunications technology is empowering firms to reach more customers with fewer resources and manpower.

- Telecommunications is the exchange of information in any form (voice, data, text, images, audio, video) over networks.

- The Internet is the most widely visible form of telecommunications in your daily lives.
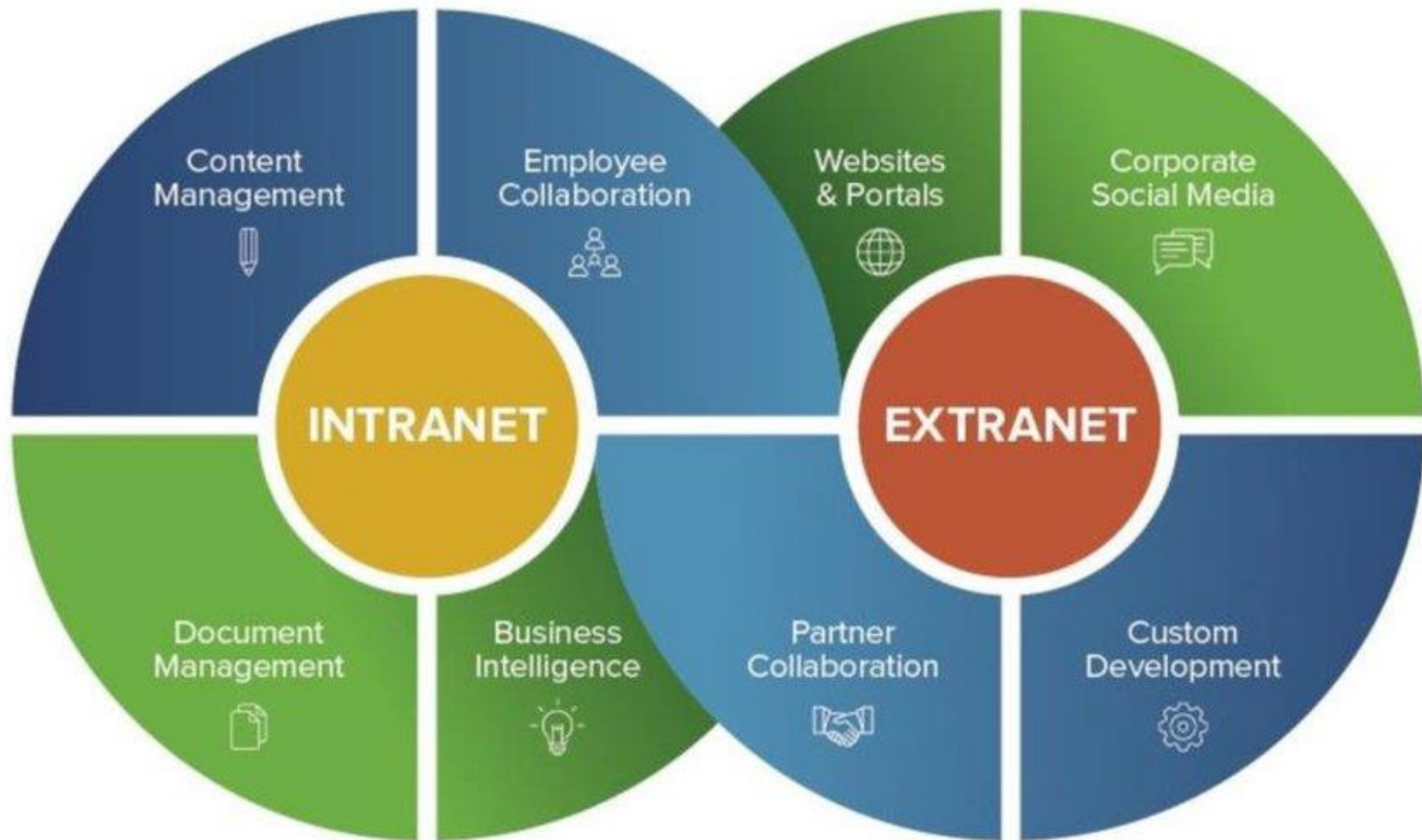
The Role of Intranets

An intranet is a private network contained within an enterprise that is used to securely share company information and computing resources among employees.

Uses of the intranet

- Streamlining everyday activities by making repeated tasks more feasible.

- Centralizing and managing important information and company data in a single database.

- Making collaboration easier since information can be shared across the entire network.

- Providing personalized content to employees based on their role within the company.

- Improving internal communication by making employee directories, company news and organization charts readily available.

- Providing fast and easy access to information about company policies, benefits and updates.

The Role of Extranets

Extranets are network links that use Internet technologies to interconnect the intranet of a business with the intranets of its customers, suppliers, or other business partners.

Companies can use an extranet to:

- Exchange large volumes of data

- Collaborate with other companies on joint development efforts

- Jointly develop and use training programs with other companies

- Provide or access services provided by one company to a group of other companies, such as an online banking application managed by one company on behalf of affiliated banks

Telecommunications Network Alternatives

Five basic categories of components;

- **Terminals**

    such as networked personal computers, network

    computers, net boxes, or information appliances.

- **Telecommunications processors**

    which support data transmission and reception

   between terminals and computers.

Telecommunications channels;

over which data are transmitted and received.

Telecommunications channels may use combinations of media, such as copper wires, coaxial cables, or fibre-optic cables, or use wireless systems like microwave, communications satellite, radio, and cellular systems to interconnect the other components of a telecommunications network.
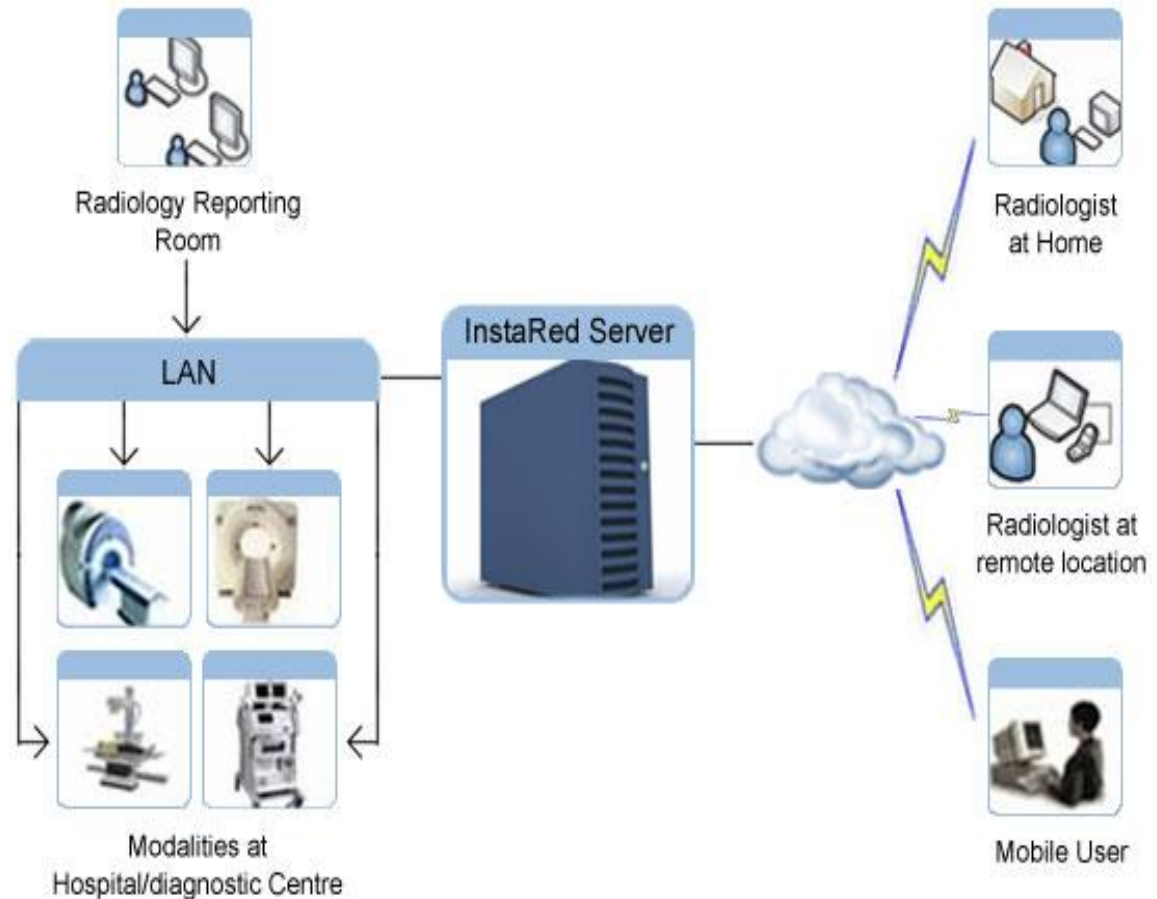
- **Computers** of all sizes and types are interconnected by telecommunications networks so that they can carry out their information processing assignments.

- **Telecommunications control software** consists of programs that control telecommunications activities and manage the functions of telecommunications networks.

Types of Computer Networks
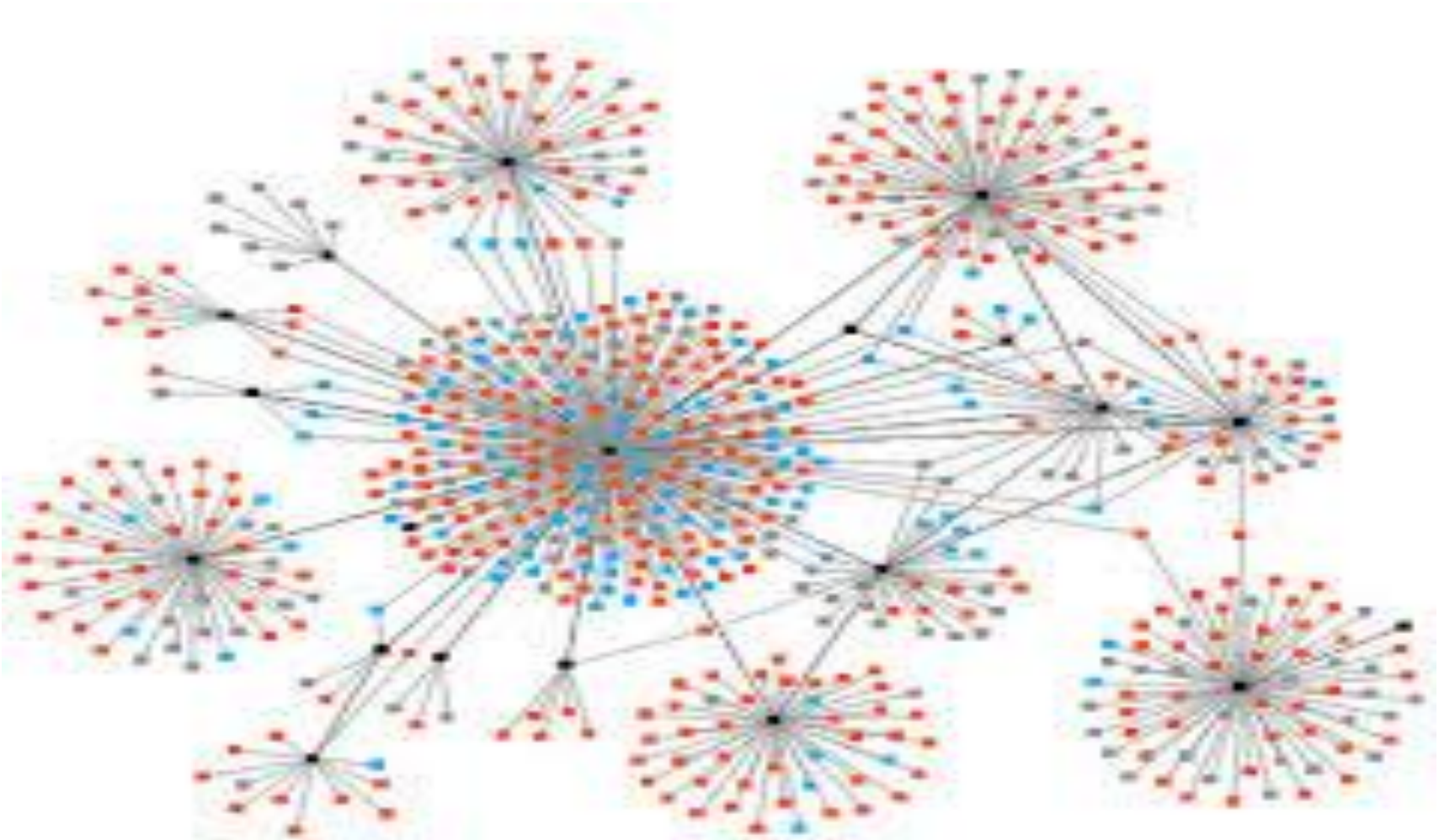
LAN(Local Area Network)

It is designed to connect personal computers.LANs typically connect a few computers in a small office, all the computers in one building, or all the computers in several buildings .


Radiology Reporting Room

LAN

Modalities at Hospital/diagnostic Centre

InstaRed Server

Radiologist at Home

Radiologist at remote location

Mobile User

Wide Area Networks (WANs)

Wide area networks (WANs) span broad geographical distances—entire regions, states, continents, or the entire globe. The most universal and powerful WAN is the Internet.
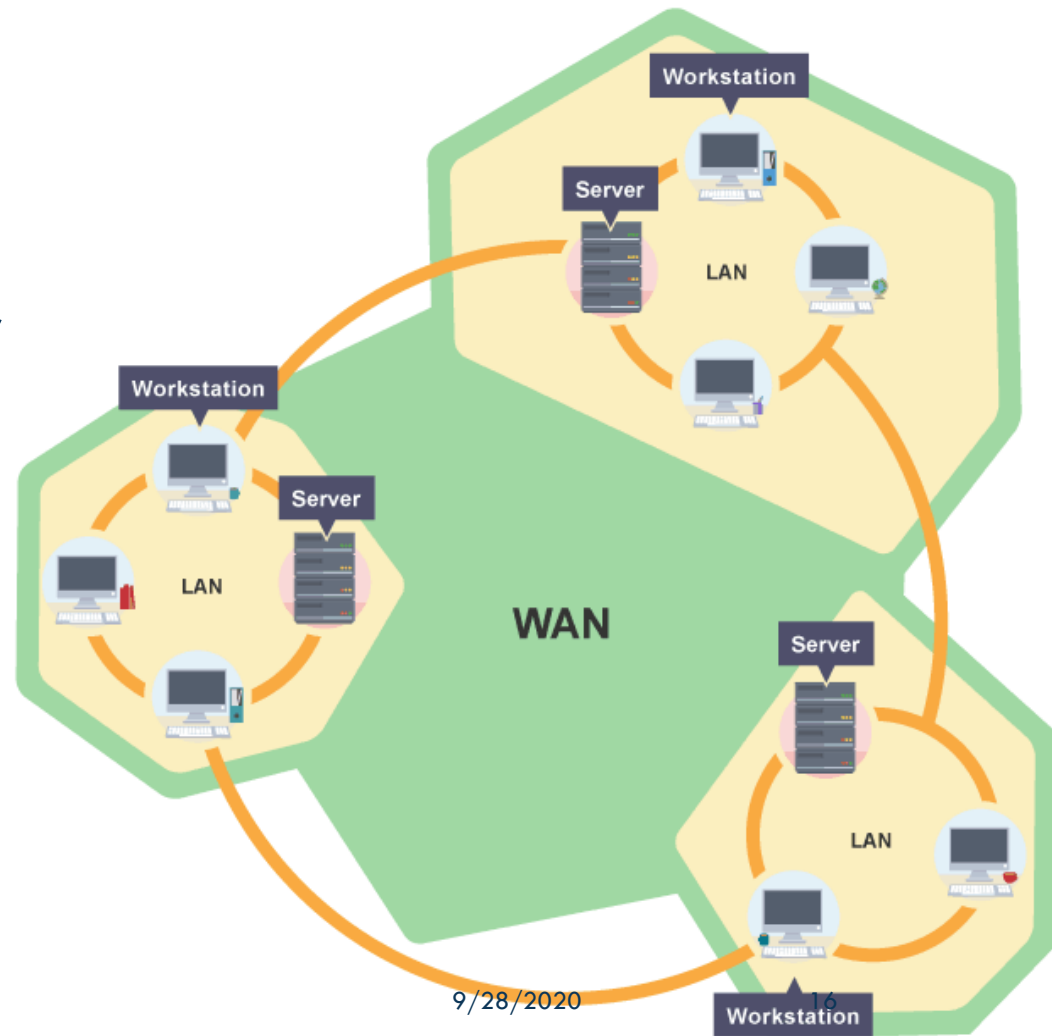
Metropolitan Area Network (MAN)

A metropolitan area network (MAN) is a network that spans a metropolitan area, usually a city and its major suburbs. Its geographic scope falls between a WAN and a LAN.
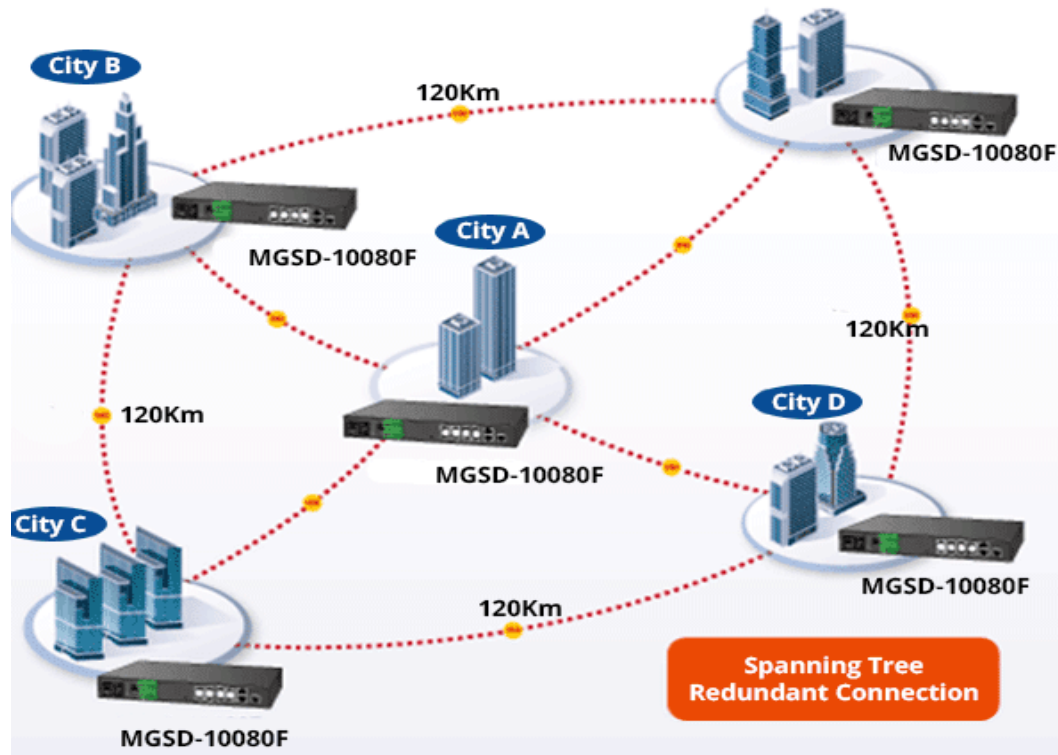
Telecommunication channels

It can broadly be classified into two categories, namely,

1. Guided media ,bounded ,(wired)

2. Unguided media,un-bounded(wireless).

Both media are used for short distance (LANs, MANs)

and long distance (WANs) communication.

Wired media

Bounded transmission means having connectivity between a source and destination using cables or wires.

The signals have to travel through this channel i.e. physical media and this makes it limited to its expansion.

Three types of wired media

Copper Twisted pair

Copper Coaxial Cable

Optic Fiber Cable

Twisted Pair cable

It is the most widely organized media type across the world. It is well known that twisted pair cable consists of a pair of insulated wires twisted together, which is widely used for Ethernet cable.
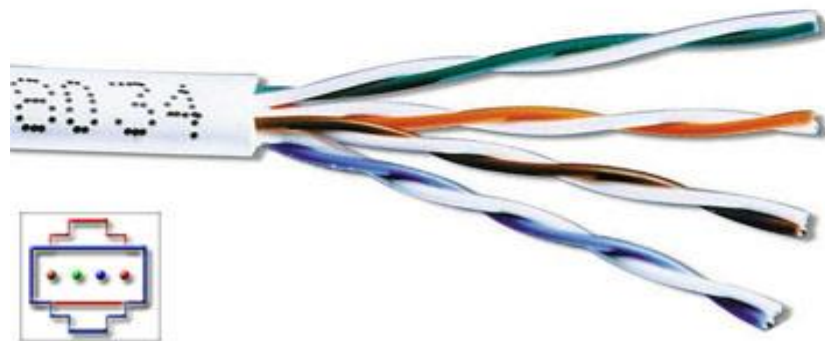
It is classified into two types,

1. Shielded Twisted Pair (STP)

2. Unshielded Twisted Pair (UTP)

Shielded twisted pair (STP)

Unshielded twisted pair (UTP)

Uses of twisted pair cable

- They are also used in Ethernet LAN cables within homes and offices.

- It support low to High Data Rates .

- The telephone link connecting every home with the local telephone exchange is made of twisted pair copper

Coaxial cable

- It is used in the transmission of video, communications, and audio.

- This cable has high bandwidths and greater transmission capacity.

- It is also used in networks and what allow a broadband cable Internet connection using a cable modem.

Coaxial cable and Crimping tool

Coaxial cable

Advantages

- Used in long distance telephone lines.

- Transmits digital signals at a very high rate

- Much higher noise immunity

- Data transmission without distortion.

- The can span to longer distance at higher speeds as they have better shielding when compared to twisted pair cable

Fiber Optic

An **optical fiber cable** is a cable containing one or more optical fibers that are used to carry light. It is used f long distance telecommunication, or providing a high-speed data connection between different parts of a building.

Fiber optic cable has bandwidth more than **2 gbps (Gigabytes per Second)**

Optical fiber

Advantages :

- Provides high quality transmission of signals at very high speed.

- These are not affected by electromagnetic interference, so noise and distortion is very less.

- Used for both analog and digital signals.

Optical fiber

Disadvantages :

- It is expensive

- Difficult to install.

- Maintenance is expensive and difficult.

Wireless media, Un-guided media

Unguided media relates to data transmission through the air and is commonly referred to as wireless.

Examples of Unguided media are:

- Microwave

- Radio waves

- Infrared waves

- Satellites

Microwave

Microwave transmission is usually point-to-point using directional antennae with a clear path between transmitter and receiver.
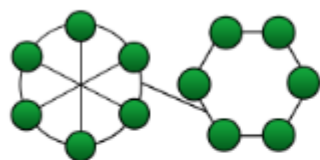
Radio transmission

Radio transmission works with or without line of sight. If line of sight is possible then transmission can take place between sending antenna and receiving antenna.

A LAN is very useful for sharing resources, such as data storage and printers.
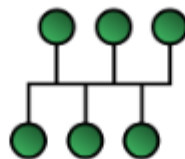
LANs can be built with relatively inexpensive hardware, such as hubs, network adapters and Ethernet cables.

Types of Network Topology

Network Topology is the schematic description of a network arrangement, connecting various nodes(sender and receiver) through lines of connection.
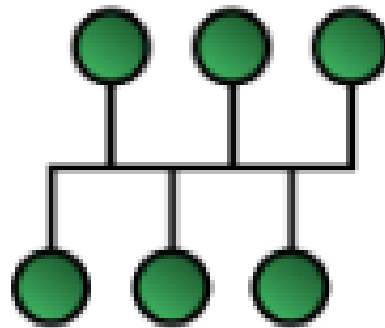
BUS Topology

Bus topology is a network type in which every computer and network device is connected to single cable. When it has exactly two endpoints, then it is called Linear Bus topology.
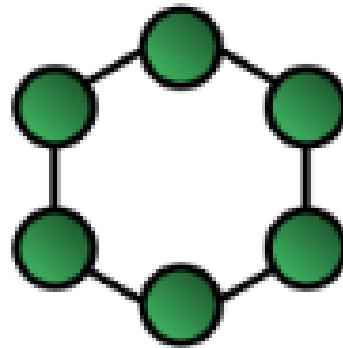

BUS Topology

Advantages of Bus Topology

- It is cost effective.

- Cable required is least compared to other network topology.

- Used in small networks.

- Easy to expand joining two cables together.

Disadvantages of Bus Topology

- Cables fails then whole network fails.

- If network traffic is heavy or nodes are more the performance of the network decreases.

- Cable has a limited length.

- It is slower than the ring topology.

It is called ring topology because it forms a ring as each computer is connected to another computer, with the last one connected to the first. Exactly two neighbours for each device.

RING Topology
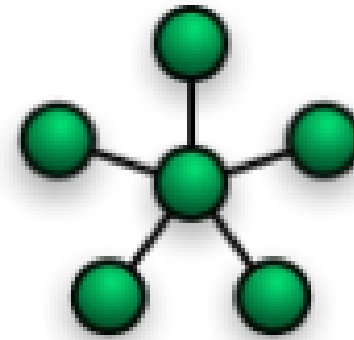
Advantages of Ring Topology

- Transmitting network is not affected by high traffic or by adding more nodes, as only the nodes having tokens can transmit data.

- Cheap to install and expand

Disadvantages of Ring Topology

- Troubleshooting is difficult in ring topology.

- Adding or deleting the computers disturbs the network activity.

- Failure of one computer disturbs the whole network.

STAR Topology

In this type of topology all the computers are connected to a single hub through a cable. This hub is the central node and all others nodes are connected to the central node.

STAR Topology

Advantages of Star Topology

- Fast performance with few nodes and low network traffic.

- Hub can be upgraded easily.

- Easy to troubleshoot.

- Easy to setup and modify.

- Only that node is affected which has failed, rest of the nodes can work smoothly

Disadvantages of Star Topology

- Cost of installation is high.

- Expensive to use.

- If the hub fails then the whole network is stopped because all the nodes depend on the hub.

- Performance is based on the hub that is it depends on its capacity

MESH Topology

It is a point-to-point connection to other nodes or devices. All the network nodes are connected to each other.

MESH Topology

TREE Topology

It has a root node and all other nodes are connected to it forming a hierarchy. It is also called hierarchical topology. It should at least have three levels to the hierarchy.

TREE Topology
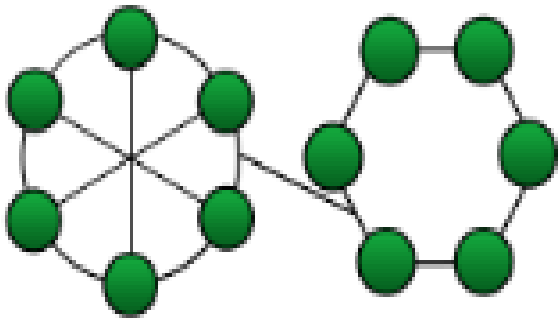
Advantages of Mesh Topology

- Each connection can carry its own data load.

- It is robust.

- Fault is diagnosed easily.

- Provides security and privacy.

Disadvantages of Mesh Topology

- Installation and configuration is difficult.

- Cabling cost is more.

- Bulk wiring is required.

HYBRID Topology

It is two different types of topologies which is a mixture of two or more topologies.

For example if in an office in one department ring topology is used and in another star topology is used, connecting these topologies will result in Hybrid Topology (ring topology and star topology).

HYBRID Topology

Advantages of Hybrid Topology

- Scalable as size can be increased easily.

Disadvantages of Hybrid Topology

- Complex in design.

- Costly.

Coaxial cable

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